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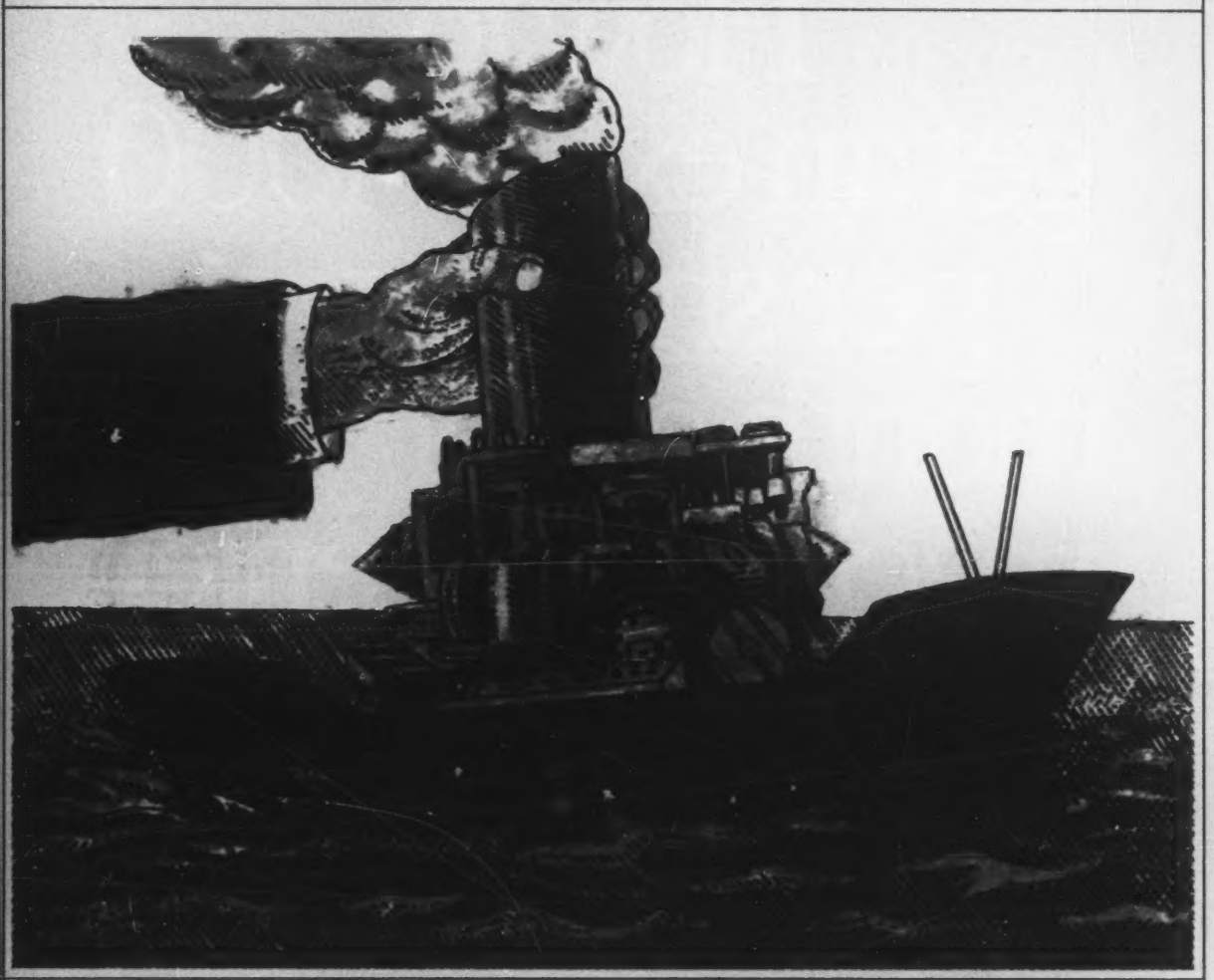


WILL TRADE PACTS HELP MACHINE TOOL BUILDERS?

Though the Commerce Department says the restraint agreements will bolster the U.S. builders' share of the market, few in industry see little improvement in orders this year.

Even though it took years to win its fight against imports, the domestic machine tool industry shouldn't expect any immediate miracles from the Reagan Administration's new limits on foreign machine tools, financial experts contend.

And, industry observers contend the domestic machine tool builders are going to have major problems because of the Tax Reform Act of 1986 and a stagnant market for machine tools.

Voluntary Restraint Agreements (VRAs) on machine tool imports from Japan and Taiwan and import restrictions on machine tools from Switzerland and West Germany were announced late last year with much fanfare by the U.S. Department of Commerce and the White House. That action came after years of lobbying by domestic machine tool interests, and months of inside fighting by members of the Reagan Administration.

Essentially, representatives of the machine tool industry wanted imports rolled back to the levels of the early 1980s because foreign machine tools continued to capture larger shares of the U.S. market and posed a real threat to the continued profitability of the domestic industry. To force action on the issue, several years ago the domestic industry filed formal pe-

Fewer Machine Tools From the Far East. . .

Japan

	1985	1986*	1987	Net Change**	Pct Change
NC Lathes	3691	3835	3592	−243	−6.3
Non-NC Lathes	437	719	359	−360	−50.1
Mach. Centers	3735	3389	2436	−953	−28.1
Milling Mach.	4852	333	476	+143	+42.9
NC P&S	424	415	146	−269	−64.8
Non-NC P&S	421	449	450	+1	+0.2
Total	9190	9140	7459	−1681	−18.4

Taiwan

NC Lathes	180	504	202	−302	−59.9
Non-NC Lathes	2766	2355	1842	−513	−21.8
Mach. Centers	238	348	220	−128	−36.8
Milling Mach.	3929	3083	2915	−168	−5.4
Total	7113	6290	5179	−1111	−17.7

. . . But Little Change In Imports From Europe

West Germany

	1985	1986*	1987	Net Change**	Pct Change
NC Lathes	150	180	169	−11	−6.1
Non-NC Lathes	311	171	255	+84	+49.1
Mach. Centers	81	127	75	−52	−40.9
NC P&S	33	40	25	−15	−37.5
Non-NC P&S	453	385	389	+4	+1.0
Total	1028	903	913	+10	+1.1

Switzerland

NC-P&S	72	56	55	−1	−1.8

* Annualized nine months 1986 figures
** Net change from 1986 to 1987

Source: U.S. Commerce Dept.

titions with the government to limit those imports.

Meanwhile, the real battle within the Reagan Administration started in late 1985, when some officials became alarmed because machine tool imports rose from 26.4 pct to 43 pct of the U.S. market in only a few years.

They were worried about the national security problems with a feeble U.S. machine tool industry if the country fought a long term war. They were also worried about the shrinking industrial base of the defense industry at a time when Japanese machine tool makers had tripled their U.S. market from $535 million to $1.5 billion, and Taiwanese and European manufacturers were also getting larger shares of the U.S. market.

Facing those national security problems, Commerce Secretary Malcolm Baldrige and Defense Secretary Caspar Weinberger teamed up to push the idea of forcing a cutback of 90 pct of foreign machine tools to keep the U.S. industry ready to meet a national emergency. However, they soon ran up against U.S. Trade Representative Clayton Yeutter and other ardent free traders in the Administration, and President Reagan was convinced to take a softer position.

In the end, U.S. trade negotiators threatened the Japanese and Taiwanese with 25-year-old Federal trade laws to cut back the imports, and those governments made some concessions on their machine tool exports.

The final agreement itself was complex, but a Commerce Department report breaks it down into these main components:

•First, the department found that imports represented a threat to U.S. national security in seven of 18 machine tool product categories. Specifically, it mentioned imports of machining centers, vertical numerically controlled lathes, horizontal numerically controlled (NC) lathes, non-numerically controlled (non-NC) lathes, milling machines, and numerically controlled and non-numerically controlled punching and shearing machines.

•Based on these findings, specific agreements were reached in each of the seven product categories. For example, the Japanese agreed to 1987 market levels of 7,459 units, including: 3,592 NC lathes, 359 non-NC lathes, 2,436 machining centers, 476 milling machines, 146 NC punching and shearing machines, and 450 non-NC punching and shearing machines.

•For Taiwan, the 1987 market levels will be a total of 5,179 units, including: 202 NC lathes, 1,842 non-NC lathes, 2,915 milling machines, and 220 machining centers.

•Meanwhile, the restraints placed on West Germany would allow that country to export only 913 units to the U.S., including: 389 non-NC punching and shearing machines, 169 NC lathes, 255 non-NC lathes, 75 machining centers, and 25 NC punching and shearing machines.

•In a much smaller category, the department reported that Switzerland had agreed to send only 55 NC punching and shearing machines.

In addition to those agree-

ments, Commerce officials told several other countries not to try to fill the void left by the import restrictions. While the department did not officially announce those countries, the American Machine Tool Distributors' Association (AMTDA) said the countries are believed to be Great Britain, Spain, Italy, Sweden, Brazil, South Korea, and Singapore.

Japan and Taiwan

While making optimistic predictions about the effect of these restrictions, the Commerce Department noted that the two biggest exporters to the U.S., Japan and Taiwan, agreed to limit their exports for five years, beginning this January. And, it said, the combined effect of those restrictions could create for U.S. machine tool makers new market opportunities of about 3,300 units this year. In 1985, those machines were imported at a value of about $155 million.

In addition, the department said, over the next five years of import restrictions, U.S. machine tool makers could increase domestic sales by about 16,500 units, and the imported values of these machines would be $775 million.

In a letter to its membership, AMTDA said of the Commerce Department's projections: "These additional sales would represent an overall market share increase of 35 pct to 44 pct for this portion of the U.S. machine tool industry. The Department of Commerce also believes that the VRAs will preserve employment in the U.S. machine tool industry."

It added, "If the industry continued to lose jobs at its current rate, it would lose about 10,700 workers over the next five years. The VRAs will help ensure that jobs remain in the U.S. The Department of Commerce also believes that increases in the capacity utilization and additional revenues of the U.S. machine tool industry would permit more investment in research development and research facilities. The Commerce Department estimated that new investments in plant and equipment could total $150 million over the five-year period."

In announcing the agreements, President Reagan was optimistic, saying, "The revitalization of the domestic machine tool industry is primarily the industry's own responsibility. However, for national security purposes, the government has a role in facilitating the industry's recovery effort."

Mr. Reagan noted that Japan and Taiwan voluntarily agreed to reduce their imports to the U.S. for five years, while the U.S. had to place limits on the imports from Switzerland and West Germany.

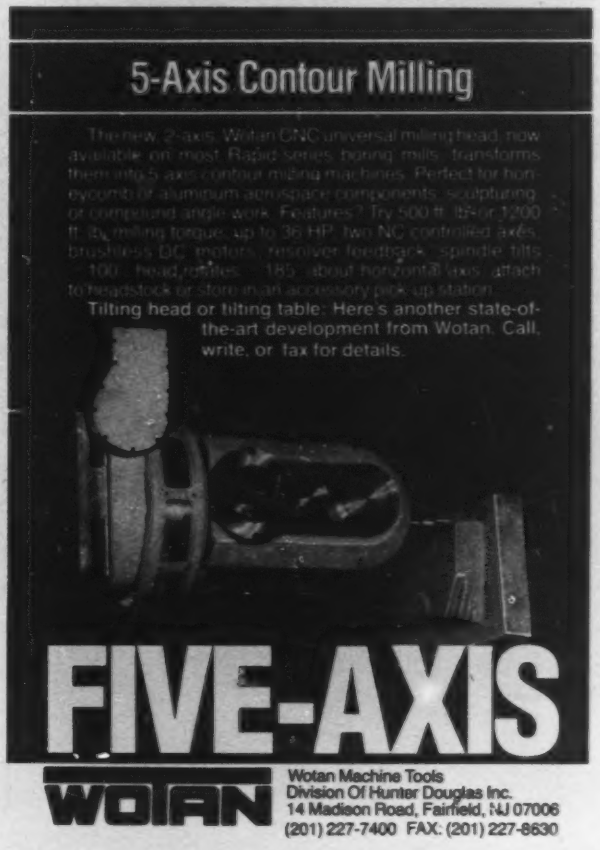
Regarding those European nations, Mr. Reagan said, "I have directed the Department of Commerce and the U.S. Customs Service to monitor machine tool imports to determine whether these limits are being exceeded. If we determine that exports of these machine tools exceed these limits and undermine the integrity of the machine tool revitalization program, I am prepared to take unilateral action under U.S. law."

And, Mr. Reagan also outlined these additional steps to help the domestic industry:

•Requiring the Defense Department to work with the Commerce Department to "help integrate the domestic industry more fully into the defense procurement process by providing the industry with more timely information about defense programs and future procurement requirements."

•Linking the domestic industry with defense programs "to improve manufacturing technology," providing up to $5 million in Defense Department funds for research on manufacturing, and then sharing that research with companies in the industry.

•And, Mr. Reagan promised to develop a special training pro-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gram for machine tool operators, engineers and managers, and to help firms that want to start cooperative R&D projects.

However, despite those predictions, the Commerce Department also furnished other figures that showed restricting the imports would not be as sweeping an action as the President and his cabinet officers had indicated.

For example, in 1986 the Japanese sent an estimated 9,140 units to the U.S., and that would drop to the 7,459 units this year. That was a total decrease of 18.4 pct not nearly in the range of the 90 pct first advocated by Secretary Baldrige. And, while the Japanese had agreed to reduce their exports of machining centers to the U.S. by 953, the agreement also called for allowing that nation to boost its exports of milling machines by 143.

The reductions for Taiwan followed a similar pattern, dropping from an estimated 6,290 units in 1986 to the 5,179 machine tools this year, a decrease of 17.7 pct.

In addition, although West Germany must cut back its machining centers sent to the U.S. by 40.9 pct this year, it would also be allowed to ship 49.1 pct more non-NC lathes. In this case, the net result is that West Germany's machine tool exports to this country will actually grow from 903 in 1986 to 913 this year, a boost of 1.1 pct. Meanwhile, the imports from Switzerland will have a minimal impact since that country sent the U.S. 56 machine tools last year and can send 55 this year, a decrease of 1.8 pct.

Little Impact

In the weeks since these measures were announced, industry experts have been analyzing them for their impact on domestic machine tool makers.

One industry economist who studied the situation came to this conclusion: "Despite all the talk, this isn't going to have a major impact on the U.S. industry. Those reductions will help, but they won't turn the industry

Foreign Builders Take a Big Slice of a Smaller Pie

Machine tool orders for January fell 23 pct to $147.8 million from $190.8 million in January 1986, according to the National Machine Tool Builders' Association (NMTBA).

January orders for lathes, milling machines, machining centers, grinders, boring mills and other machinery used to shape metal by cutting totaled $99.9 million, down 26 pct from $135 million a year earlier, NMTBA reported last month. That broke down to $88 million in those orders for domestic machine tools and $11.9 million for foreign products.

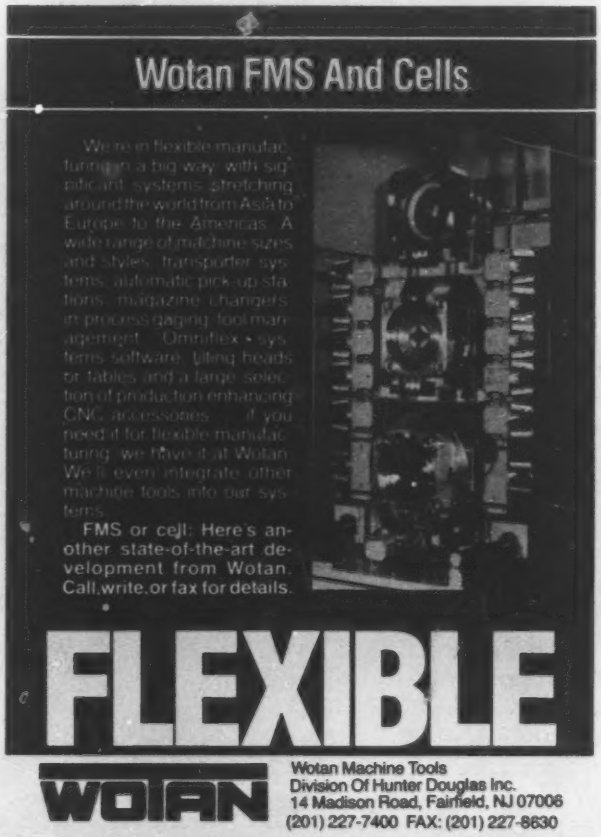
Meanwhile, orders in December were $87.2 million, with domestic manufacturers getting $74 million of business and the foreign market taking $13.2 million.

A year earlier, the domestic market was $124.75 million, while the foreign market totaled $10.25 million.

Orders in January for metalforming presses and other machinery used to shape metal with pressure totaled $47.9 million, which was 14 pct below the $55.8 million of January 1986, the trade group also reported.

The domestic market for metalforming machine tools was $33 million in January, with foreign competition getting $14.85 million. In January 1986, the domestic industry got $50.2 milion in those orders, while foreign competition received orders for $5.5 million of the products.

The January figures in this segment of the market were slightly below the $49.3 million in orders received in December, with U.S. manufacturers getting $37 million in new business and foreign machine tool companies with $12.25 million in new business.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around. Only a major surge in manufacturing will do that."

At the same time, a company spokesman for Cincinnati Milacron, Inc., would say only that the company hoped the VRAs would be beneficial for the machine tool industry, but it was too early to make more specific predictions.

Eli Lustgarten, an industry analyst with Paine Webber, discounted a major impact from the import limits, saying, "The real problem with the machine tool industry is a lack of demand."

Current demand for machine tools is very much lower than in 1980 or 1981, he said, and on a worldwide basis there is a large inventory of unsold machine tools.

As for the immediate effect of the import limits, he said it was "too early to tell," and that there was a potential shrinkage of the machine tool market for the latter part of this year and into 1988. Demand might improve, he said, toward the end of the decade.

While the import limitations made a political splash in Washington, Ralph Nappi, AMTDA's director of management services, said his association's membership is taking a wait-and-see attitude about how they will affect the domestic machine tool distribution business.

He said the trade group's members "don't seem that excited" about the restraints, and that about 75 pct of AMTDA members responding to a survey about issues important to them said they didn't know of the VRAs' impact or felt they would have little practical impact.

Many of the distributors, Mr. Nappi said, felt "this was just another thing that occurred and they would have to live with it."

Meanwhile, the domestic machine tool industry came into this year with financial problems. Orders for December 1986 for U.S.-made machine tools fell 22 pct from a year earlier, according to the National Machine Tool Builders' Association (NMTBA). At the same time, the trade group reported that orders last year dropped 16 pct from 1985 and that the year-end backlog of unfilled orders was down 28 pct from 1985 levels.

NMTBA also said machine tool orders for all of 1986 were $2.12 billion, compared with $2.53 billion for 1985 and $2.92 billion for 1984. In addition, year-end backlogs were $1.20 billion, down from $1.67 billion at the end of 1985. Machine tool shipments in December were $271.9 million, down 27 pct from a year earlier, and orders for lathes, machining centers, milling machines, grinders, boring mills and other machines used to shape metal through cutting totaled $86.8 million in December. That was a drop of 26 pct from $116.6 million a year earlier, while orders were up from $84 million in November.

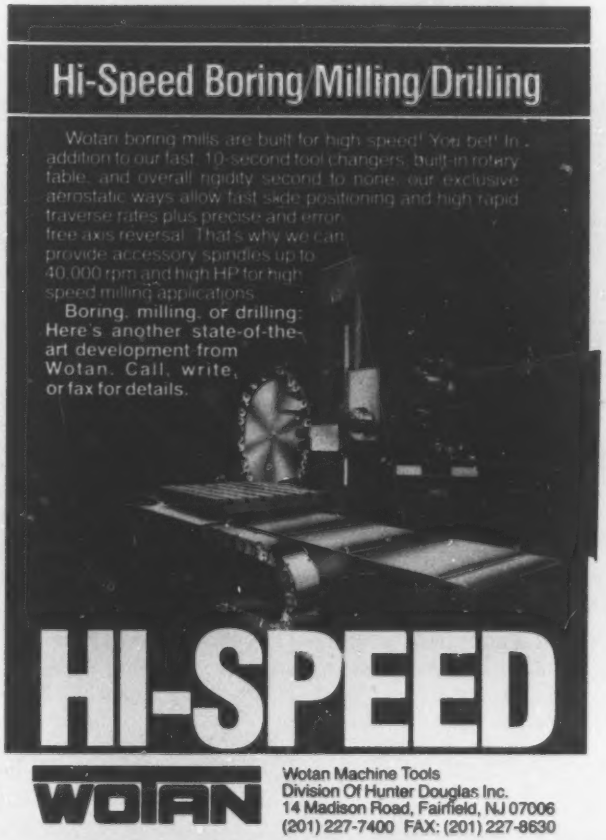
In another area, December orders for metal-forming presses and other machines used to shape metal through pressure totaled $49.3 million, down 16 pct from $58.5 million a year earlier, and December orders in this area were up only 1.3 pct from November.

Industry officials attributed much of this slump to the effects of some provisions of the Tax Reform Act of 1986.

That law eliminated a provision giving businesses a 10 pct tax credit for the purchase of many capital items. In addition, the bill has much less generous provisions for depreciation of major equipment items, and it eliminated the tax credit for most capital goods, retroactive to Jan. 1, 1986.

NMTBA President James Gray said the tax bill had hurt investments in machine tools, adding, "We hope that, as the negative results of eliminating investment incentives become more clear, the need to reinstate tax provisions that encourage growth will also become more clear."

By Whitt Flora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For Information, Circle 95

Kearney & Trecker's new subsidiary, Synetics, has a truckload of modular software such as scheduling and simulation packages for cell control.

HERE COME THE CELLS AND CELL CONTROLLERS

To stay afloat in waters infested by new competition and changing markets, companies are abandoning automation for integration, or more specifically, the world of cells and cell controllers.

Ever feel like you are on a treadmill going nowhere? To stay competitive, you've worked overtime, scrimped and saved, bought some automated equipment—some programmable controllers possibly, a CNC machine tool or two, perhaps a robot.

Now suddenly your automation efforts seem inadequate. Now 'integration' not 'automation' is 'in.' So, despite the fact that you've put a lot of effort in getting your computer-controlled machines up and running, they are being labeled 'islands of automation.'

And, like having a cigarette, having islands of automation is no longer cool.

But owning a shop full of standalone equipment is no reason to contemplate slitting your wrists. It offers a ready-made platform from which you can integrate isolated production into cooperative work cells.

New competition and rapidly changing markets are demanding that firms again crank up their modernization efforts. Only the flexible integration offered by cells will give the speed and coordination needed to counter bruising off-shore competition.

If devices such as CNC machine tools and programmable controllers (PLCs) represent the the first step in modernizing the factory, a good number of U.S. companies are poised to take the second step: integrating that automation. For most this means combining automation devices into cells.

Central to this effort is the emergence of the cell controller, a

computerized supervisor designed to get various machines working in harmony and get timely production data to management.

Fortunately, a diversity of products and services is emerging to meet growing cell control needs. Unfortunately, this hodgepodge of support confuses potential users.

"I think that one of the realities of the cell control market is that it is very much in the embryonic stages," said Don Bell-Irving, manager factory automation marketing, Digital Equipment Corp., Maynard, Mass. "Nobody really knows what a cell controller is. It's different things to different people."

Everyone's Business

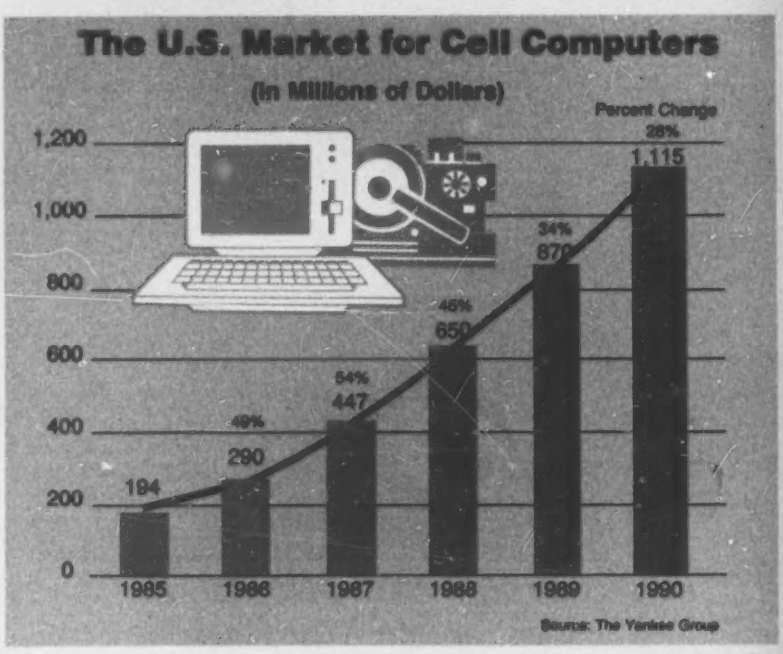
With the parameters of cell control so nebulous, everyone is moving into the cell control business. Manufacturers of corporate and departmental computers such as IBM and Digital are pushing their computer and communications expertise down to the cell level, while control manufacturers such as Allen-Bradley and Gould are pushing their shop floor control knowledge up into the cells.

Besides computer and PLC makers, machine tool builders, robot manufacturers, software suppliers, systems integrators, and a raft of others are targeting the cell control market.

The cell control level, many say, is becoming a real battleground. The reasons for the mad scramble to grab a chunk of this high ground are four-fold:

•The landscape is so ill-defined, almost everyone sees the possibility of staking a claim at least somewhere.

•Of all the levels of automation that are required to integrate a manufacturing operation, the cell level appears to have the most strategic importance as well as the greatest growth potential (see charts, this page). For the cell is the bridge that joins the company's information and production systems. Here is where executive planning and factory control meet head on.



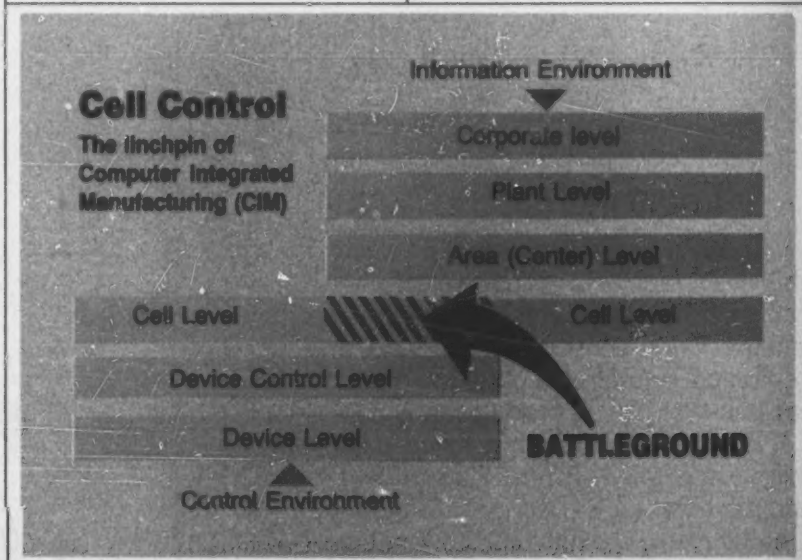
•Whoever controls the cell level, will have a good deal to say about structure of the lower levels of factory automation.

•If the various levels of automation are viewed as stepping stones to computer-integrated manufacturing (CIM), the cell control step is logically the next one for many vendors to address.

Machine tool and PLC builders, spurred by customer requests for integrated offerings, see their growth into cell control as a natural evolution. Similarly, computer firms offering corporate information systems, naturally would like to extend their systems deep into the factory.

Given this diverse crowd of vendors and the still ill-defined landscape of cell control, it is little wonder that many manufacturers are hesitant about proceeding with cell control.

Besides the uncertainty about



what type of cell controller to buy, there is confusion about what it should be doing once installed. For a cell controller's functions are by no means cut and dried.

For example, a cell controller might be used as:

•A manufacturer's communications hub.

•His coordinator and director of shop floor activities.

•The conduit to a broad panorama of devices.

•The collector of production-status information.

•The preparer of data for supervisory front office computers.

•Or the controller of real-time factory floor machines and processes. And this list is by no means complete.

Nevertheless, despite the haziness over what exactly a cell controller does and is, its function can be crystallized to some degree.

John E. Jones, executive vice president, instrumentation and automation systems, Gould, Inc., Rolling Meadows, Ill., divides cell controllers into two types: cell controllers and cell computers.

"I think of cell computers as being information oriented and cell controllers as control oriented," he explained. "Not differentiating between the two functions is causing a lot of confusion."

How vendors view cell control is determined to a large extent by where they are coming from.

Two Worlds

"You have the two worlds that are attempting to make a compromise and what your perspective is determines what your compromise is," observed Dick Omdahl, manager, strategic marketing for automation products, Square D Co., Milwaukee. "If you're from the computer world, you compromise off the real-time aspect of control. If you are from the control world, you compromise in favor of real-time control and eliminate some of the more computer-like functions."

Because of the variety of vendors and the specific needs of specific manufacturers, cell controllers today, for the most part, are niche products for niche markets, but that will change.

The key to successful cell control, according to Interactive Graphics, is the interaction between the employee and the information and control system.

"Today, different people tend to define cell control differently, so the functions within these products are different," observed Mr. Omdahl. "However, I think that is a short term thing. I believe there is going to be more standardization but it will take time."

As Mr. Omdahl notes, companies don't buy a cell controller because they see it as the next step in their factory automation plan but because of a specific need.

For example, an automotive supplier might select a cell controller because the auto company insists that its suppliers keep statistical process control records. Or a welding company that has to continually change its welding parameters might choose cell control as the best way to get its weld schedules down to the welders.

Basic Functions

Yet though cell control today is customized to meet specific needs, cell control requirements fall into several basic areas.

"We feel that there is a pretty generic set of functions that go on in the cell controller, but for the cell controller to be effective, everyone is going to be customized to some degree," explained Jeff Chamberlain, CIM market-development manager for Hewlett Packard's Data Systems Division, Palo Alto, Calif., "so that is why our program involves working with software suppliers to provide some of the basic functions." Then, the necessary customization is left up to systems integrators or the customers themselves.

According to Digital's Mr. Bell-Irving, the two most important basic functions that a cell controller can offer are flexibility and communications.

When deciding how to make a product, firms used to choose production methods that emphasized efficiency and standardization at the expense of flexibility. Today, cell controllers permit both efficiency and flexible production.

"Besides flexibility, today's companies are moving toward integration," said Mr. Bell-Irving. "To run a company economically, you have to coordinate all the different operations within it."

And much of that coordination centers around the cell controller. It must not only coordinate the factory floor but also work with other cell controllers and business planning computers.

"Whatever else it is, a cell controller has to be highly flexible because processes and product mix are going to change," said Mr. Bell-Irving. "And the second absolute requirement we have observed is that it be integratable."

For Jody Kurtzhalts, general manager, Synetics, Milwaukee, the scheduling ability of a cell controller is critical. "At its most basic," she explained, "you need to have a system capable of routing a series of parts."

Synetics software not only offers dynamic machine loading but will optimize work loads as well. For example, if a cell is to make a hundred different parts, and those

parts require a variety operations sequences, the software will determine optimum sequencing.

Synetics is a newly formed subsidiary of Kearney & Trecker Corp. It was formed to focus and refine K&T's manufacturing software expertise and adopt it to CIM and cell control demands. That expertise has been accumulating for some 15 years—ever since K&T began selling flexible manufacturing systems.

Already some 5,000 specific software modules have been developed to support some 37 functional tasks, like routing, simulation and inspection.

Inadequate Software

Because of the newness of cell control, one of its problems is a lack of adequate software. A good deal of the software developed today is of the custom variety. Customization is risky, for you never know what you will get until you get it. With time-tested software, K&T and some of the other flexible manufacturing system pioneers believe they have a software edge over the competitors.

The most requested requirements for a cell controller, according to a user survey conducted by the Automation Resource Group, Wellesley, Mass., include capabilities to: communicate; monitor and control; perform management functions (like tool managing and maintenance scheduling); and collect and store data.

One important function left off of the list is the ability of a controller to interact with people.

"The real issue is not just integrating pieces of CIM but integrating people into it," said Deborah Allen, marketing manager, Interactive Images Inc., Woburn, Mass. "Conquering the user interface barrier will be the key determinant of CIM success."

With people in mind, Interactive Images developed EASEL software. The company calls it a user interface development tool. It can be used for cell control, for it has many of the functions of a cell controller such as graphical representation of statistical data, including quality control and statistical process control; data base query, including bill of material and inventory and production order status; data collection applications such as inspection; and production management and control for processes using PLCs.

EASEL, run on an IBM PC, aims at integrating people into computer-integrated manufacturing by allowing workers to enter and retrieve complex information simply by touching customized icons on the computer screen.

And because it is application and hardware independent, the software can serve as a front end to any existing CIM environment.

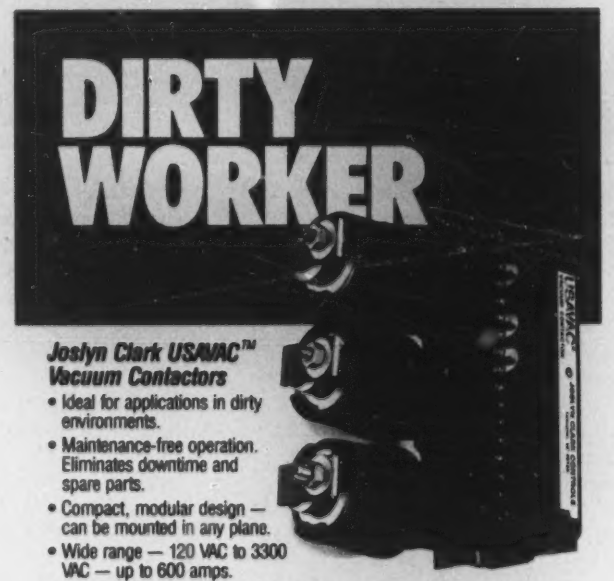
A final point: maybe the most important one. Despite the focus today on cell control hardware and software, neither should enter the picture when initially considering cellular manufacturing.

"Discussions about specific software and hardware at the conceptual road map level—where you are going to proceed and how you are going to get there—is a tremendous blind alley," cautioned David Lilly, vice president and general manager, automated systems division, Integrated Automation, Alameda, Calif. "A tremendous amount of our creativity goes early on into choosing between technologies, rather than first determining what has to be done. Most projects are ruined by its technology junkies.

"We say we are taking a systems approach to designing our modern factory, but we don't work out the whole architecture of functional assignments for the cells.

"I really think that the local area network issues, the MAP protocol issues, the cell controller hardware issues are distracting us from the basics of how we are going to engineer this thing."

By Robert E. Harvey



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ENERGY PRICES FUEL A PRICE RISE

Sharply higher energy prices spurred a 0.6 jump in seasonally adjusted producer prices for finished goods in January, reversing a slight price drop in December and modest increases for several months before that.

The U.S. Labor Department also noted that the prices for finished energy goods rose 9.9 pct, fueling a 0.7 pct increase for finished consumer goods in January.

In relation to major industries, the index for the net output of the domestic manufacturing sector advanced 0.8 pct in January after recording no change in December and a slight rise in November. The index for capital equipment moved up 0.2 pct in January, after inching up 0.1 pct in December. Prices advanced for aircraft, metal cutting machine tools, and transformers.

In contrast, prices declined for motor vehicles and textile machinery. Passenger cars had a price decline of 0.2 pct, following a 0.2 pct increase in December and a 0.2 drop in November.

Meanwhile, the durable manufacturing materials index registered a 1.0 pct advance for the latest month, with higher prices for hot and cold rolled steel sheets and strip, and copper. Prices for steel mill products rose 1.1 pct in January after no change in the previous month.

Prices in the domestic mining industry climbed 6.4 pct over the month, but were 22.2 pct lower than the year-ago level.

The department's longer range statistics showed that from January 1986 to January 1987, the finished goods price index fell 1.5 pct, and capital equipment prices were up 2.4 pct. But during that period, the index for energy products dropped 31.7 pct, holding down some other price increases.

Latest Month Covered: January 1987

Products	Index Reading For Month (1967 = 100)	Pct Change From Previous Month	Pct Change From Year-Ago Month
Metal Cutting Machine Tools	411.4	+ 0.8	+ 3.2
Metal Forming Machine Tools	443.1	+ 0.2	+ 1.2
Agricultural Machinery & Equip.	341.2	+ 0.4	+ 0.8
Construction Machinery & Equip.	370.8	0	+ 1.6
Oil and Gas Field Machinery	410.4	0	– 3.4
Industrial Material Handling Equip.	297.9	+ 0.1	+ 0.8
Pumps, Compressors & Allied Equip.	364.6	+ 0.2	+ 2.0
Mining Machinery & Equipment	383.8	+ 0.7	+ 0.4
Mechanical Power Transmission Equip.	349.5	+ 0.1	+ 2.8
Automobiles	247.0	– 0.3	+ 7.6
Motor Trucks – Light	324.2	+ 0.1	+ 5.9
Motor Trucks – Heavy	347.0	– 0.3	– 0.7
Railroad Equipment	364.5	0	– 0.6
Fabricated Metal Structural Products	315.9	– 0.3	+ 0.3
Electric Motors	352.0	– 0.2	+ 0.6
Valves & Fittings (Dec. 1982 = 100)	107.7	+ 0.3	+ 1.6
Ball & Roller Bearings	355.9	+ 0.1	+ 0.7
Foundry & Forge Shop Products	363.9	+ 0.2	0
Heating Equipment	271.5	– 0.1	+ 2.6
Plumbing Fixtures & Brass Fittings	323.9	+ 0.5	+ 2.9
Metal Containers	361.4	– 0.3	– 0.1
Internal Combustion Engines	353.9	0	+ 1.6

Data based on U.S. Labor Dept.'s Producer Price Index

MATERIALS PRICES

PRICE & PRODUCTION DATA

(Effective March 2, 1987)

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
Northeast Coast	157	146	119	202
Pittsburgh	199	187	170	251
Youngstown	109	114	110	113
Lake Erie	120	117	111	163
Detroit	156	146	150	150
Chicago	314	342	337	521
Midwest	168	175	163	152
Southern	158	158	138	224
Western	45	45	39	92
U.S. Production	1,426	1,430	1,337	1,868

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports unless otherwise stated. Rail transportation, handling and unloading may be charged to buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural) ..... gross-ton 58.0*
Pellets (per iron unit natural) ..... gross-ton 59.4**
Pellets (per iron unit natural) ..... gross-ton 72.45-86.9***
Mesabi, regular-unscreened ..... gross-ton 32.53
Mesabi, non-bessemer ..... gross-ton 30.03-31.53

*58.0¢—Mineral Services, Inc. as of 8/13/85. **59.4¢—Inland Steel Mining, 1/1/85 and Pickands Mather, 8/1/85, delivered hold of vessel, upper Lake ports. ***72.5¢—U.S. Steel as of 8/16/85. 86.9¢—Oglebay Norton 3/25/82, Hanna Mining and Cleveland Cliffs, 2/26/82.

STEEL PRODUCTION, COMPOSITE PRICES

(Effective March 2, 1987)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1986	To Date 1985
Net tons, in thousands	1,426	1,430	11,826	14,802
Capability Utilization Rate	66.2	66.4	65.1	70.4

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 1/4/87)	25.236	25.236	25.236	24.607
Pig Iron** (Net ton= 2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.*** (Gross ton=2240 lbs.)	$ 74.83	$ 76.50	$ 77.50	$ 73.50
No. 2 bundles	$ 50.50	$ 51.17	$ 51.17	$ 52.83

Scrap Comparison (Gross Ton)				
No. 1 steel, Pittsburgh	$ 79.50	$ 80.50	$ 82.50	$ 73.50
No. 1 steel, Philadelphia	70.50	70.50	71.50	72.50
No. 1 steel, Chicago	74.50	78.50	78.50	74.50
No. 1 bundles, Detroit	76.50	83.50	85.50	65.50
Low Phos., Youngstown	80.50	82.50	82.50	73.50
No. 1 mach'y cast., Pgh	74.50	74.50	74.50	73.50
No. 1 mach'y cast., Phila	93.50	93.50	93.50	93.50
No. 1 mach'y cast., Chi.	95.50	101.50	101.50	109.50

*Finished Steel Composite: Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
**Pig Iron Composite: Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
***Steel Scrap Composite: Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

NONFERROUS PRICES

(Effective March 2, 1987) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum (LME)	58.75	59.00	3/2/87
Copper (C)	67.50	64.50	2/26/87
Lead	26.00	27.00	2/2/87
Magnesium Ingot	153.00	148.00	12/9/85
Nickel (LME)	171.00	172.00	3/2/87
Zinc	47.00	44.50	10/6/86

ALUMINUM: Avg. for last week & previous week. COPPER (C)=cathode. LEAD: common grade. MAGNESIUM: 99.8% pig delivered. NICKEL: Avg. for last week & previous week. ZINC: high grade.

Antimony, American Laredo, Texas	$2.00
Beryllium-aluminum 5% Be, per lb. contained Be	$248.00
Beryllium-copper, per lb. cont. Be	$152.00
Beryllium 97% powder 200	$196.00
Cadmium, ton lots	$1.50
Calcium, ton lots, crown	$3.92
Chromium, 99.5% electro	$4.62
Cobalt, 99%, cathode	$12.50
Gold, per troy oz.	$404.25
Indium, per troy oz.	$3.25
Iridium, per troy oz.	$411.00
Magnesium sticks, 10,000 lbs.	$2.12
Mercury, per 76-lb., f.o.b. N.Y.	$200.00-225.00
Molybdenum, lb. tech. moly oxides, 20 lb. MO can	$3.45
Palladium, per troy oz.	$123.00
Platinum, per troy oz.	$520.00
Rhodium, per troy oz.	$1,198.00
Silver ingots, per troy oz.	$5.44
Titanium sponge, melt grade	$3.40-3.55
Tungsten powder, hyd red	$9.53-9.85
Vanadium	$6.00
Zirconium sponge	$11.20-17.00

(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb. EX-SMELTER, based on daily market in Malaysian dollars per kilo.)

February 24—298.00 February 26—298.00
February 25—298.00 February 27—301.00

Scrap Prices
Brass Mill Scrap

(Cents per lb., over 20,000 lbs. add ½ cent per lb.)

	Solids	Turnings
Copper	55½	50½
Yellow brass	49	48
Red brass	50	46
Comm. bronze	51½	46½
Mang. bronze	38½	37½
Free cutting rod ends	48	47

Custom Smelters Scrap

(Cents per lb. carload lots, del. refinery)

No. 1 copper wire	55
No. 2 copper wire	46
Light copper	40

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	48
No. 2 copper wire	40
Light copper	33
No. 1 composition	41
No. 1 comp. turnings	41
Hvy. yellow brass solids	29
Hvy. yellow brass turnings	23
Radiators	27

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum		
Segregated clippings	29	— 30
Mixed I.C. clips	27	— 28
Old sheets and cast	24	— 25
Borings and turnings	20	— 21
Duraluminum clippings	25	— 26
Copper and Brass		
No. 1 copper wire	44	— 47
No. 2 copper wire	35	— 36
Light copper	32	— 33
Radiators	22	— 23
No. 1 composition	36	— 37
No. 1 composition turnings	34	— 35
Cocks and faucets	30	— 31
Clean heavy yellow brass	26	— 28
Brass pipe	26	— 27
New soft brass clippings	39	— 40
Lead		
Heavy soft lead	9	— 10
Whole batteries	1	— 2
Type metal	18	— 19
Electrotype	15	— 16
Nickel		
Nickel solids	100	—110
Nickel rod ends	100	—110
Nickel sheets, clips	100	—110
Nickel turnings	25	— 35
Zinc		
New zinc clippings	14	— 15
Old diecast zinc	10	— 11
Aluminum		
New mixed clips	32	— 33
Old sheet	29	— 30
Old cast	29	— 30
Clean dry borings	30	— 31

EFFECTIVE MARCH 2, 1987

(Effective March 2, 1987) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of Iron Age editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 79.00 to	$ 80.00
No. 2 hvy. melting	69.00 to	70.00
No. 1 dealer bundles	98.00 to	99.00
No. 1 factory bundles (auto)	101.00 to	102.00
No. 2 bundles	45.00 to	46.00
No. 1 busheling	96.00 to	97.00
Machine shop turnings	8.00 to	9.00
Shoveling turnings	46.00 to	47.00
Cast iron borings	45.00 to	46.00
Low phos. punchings plate	99.00 to	100.00
Heavy turnings	69.00 to	70.00
No. 1 RR hvy. melting	84.00 to	85.00
Rails, 2 ft. and under	98.00 to	99.00
Scrap rails, random lgth	87.00 to	88.00
RR specialties	101.00 to	102.00
No. 1 machinery cast	74.00 to	75.00
Cupola cast	67.00 to	68.00
Heavy breakable cast	30.00 to	31.00
Stainless		
18-8 bundles and solids	490.00 to	495.00
18-8 turnings	390.00 to	395.00

Chicago

No. 1 hvy. melting	$ 74.00 to	$ 75.00
No. 2 hvy. melting	70.00 to	71.00
No. 1 dealer bundles	92.00 to	93.00
No. 1 factory bundles (auto)	92.00 to	93.00
No. 2 dealer bundles	60.00 to	61.00
No. 1 busheling	84.00 to	85.00
Shredder scrap	80.00 to	81.00
Machine shop turnings	22.00 to	23.00
Mixed borings and turnings	15.00 to	16.00
Shoveling turnings	25.00 to	26.00
Cast iron borings	40.00 to	41.00
Low phos. forge crop	95.00 to	96.00
Low phos. punchings plate 1/4 in. and heavier	110.00 to	111.00
Low phos. 2 ft. and under	103.00 to	104.00
No. 1 RR hvy. melting	78.00 to	79.00
Scrap rails random lgth	77.00 to	78.00
Reroller rails	100.00 to	101.00
Rails, 2 ft. and under	94.00 to	95.00
RR couplers and knuckles	75.00 to	76.00
RR car axles	100.00 to	101.00
No. 1 machinery cast	95.00 to	96.00
Cupola cast	85.00 to	86.00
Stove plate	96.00 to	97.00
Steel car wheels	81.00 to	82.00
Stainless		
18-8 bundles and solids	460.00 to	470.00
18-8 turnings	350.00 to	360.00
430 bundles and solids	125.00 to	135.00
430 turnings	85.00 to	95.00

Philadelphia

No. 1 hvy. melting	$ 69.00 to	$ 72.00
No. 2 hvy. melting	61.00 to	64.00
No. 1 dealer bundles	84.00 to	87.00
No. 2 dealer bundles	44.00 to	47.00
No. 1 busheling	81.00 to	84.00
Shredder scrap	84.00 to	87.00
Machine shop turnings	24.00 to	27.00
Mixed borings and turnings	24.00 to	27.00
Shoveling turnings	39.00 to	42.00
Low phos. 5 ft. and under	78.00 to	81.00
Low phos. 2 ft. punchings	96.00 to	99.00
Electric furnace bundles	94.00 to	97.00
RR specialties	80.00 to	83.00
Rails, 2 ft. and under	96.00 to	99.00
Cupola cast	80.00 to	83.00
Heavy breakable cast	52.00 to	55.00
No. 1 machinery cast	92.00 to	95.00

Detroit

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 49.00 to	$ 50.00
No. 2 hvy. melting	48.00 to	49.00
No. 1 dealer bundles	76.00 to	77.00
No. 2 bundles	39.00 to	40.00
No. 1 busheling	74.00 to	75.00
Drop forge flashings	41.00 to	42.00
Machine shop turnings	20.00 to	21.00
Mixed borings and turnings	6.00 to	7.00
Shoveling turnings	20.00 to	21.00
Cast iron borings	20.00 to	21.00
Heavy breakable cast	32.00 to	33.00
Mixed cupola cast	47.00 to	48.00
Automobile cast	71.00 to	72.00
Stainless		
18-8 bundles and solids	440.00 to	450.00
18-8 turnings	290.00 to	300.00
430 bundles and solids	115.00 to	125.00

Youngstown

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 63.00 to	$ 64.00
No. 2 hvy. melting	60.00 to	61.00
No. 1 dealer bundles	85.00 to	86.00
No. 2 dealer bundles	35.00 to	36.00
Machine shop turnings	15.00 to	16.00
Shoveling turnings	15.00 to	16.00
Low phos. plate	80.00 to	81.00
Electric furnace bundles	70.00 to	71.00
Galvanized bundles	67.00 to	68.00

Cleveland

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 59.00 to	$ 60.00
No. 2 hvy. melting	56.00 to	57.00
No. 1 dealer bundles	84.00 to	85.00
No. 1 factory bundles	85.00 to	86.00
No. 2 bundles	34.00 to	35.00
No. 1 busheling	74.00 to	75.00
Machine shop turnings	14.00 to	15.00
Shoveling turnings	14.00 to	15.00
Cast iron borings	19.00 to	20.00
Cut structural & plates, 5 ft. and under	73.00 to	74.00
Cut structural & plates, 2 ft. and under	94.00 to	95.00
Low phos. punchings plate	94.00 to	95.00
Foundry steel, 2 ft. & under	58.00 to	59.00
No. 1 RR hvy. melting	65.00 to	66.00
Rails, 2 ft. and under	97.00 to	98.00
Rails, 18 in. and under	99.00 to	100.00
No. 1 machinery cast	85.00 to	86.00
Mixed cast	52.00 to	53.00
Stainless		
18-8 bundles	445.00 to	455.00
18-8 turnings	295.00 to	305.00
430 bundles	120.00 to	130.00

Buffalo

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 55.00 to	$ 56.00
No. 2 hvy. melting	45.00 to	46.00
No. 1 busheling	79.00 to	80.00
No. 1 dealer bundles	79.00 to	80.00
No. 2 bundles	31.00 to	32.00
Machine shop turnings	13.00 to	14.00
Mixed borings and turnings	13.00 to	14.00
Shoveling turnings	19.00 to	20.00
Cast iron borings	27.00 to	28.00
Low phos. plate	80.00 to	81.00
Structural and plate, 2 ft. and under	82.00 to	83.00
Rails, 2 ft. and under	81.00 to	82.00
Scrap rails, random lgth	63.00 to	64.00
No. 1 machinery cast	76.00 to	77.00
No. 1 cupola cast	71.00 to	72.00

St. Louis

No. 1 hvy. melting	$ 70.00 to	$ 71.00
No. 2 hvy. melting	59.00 to	60.00
No. 1 busheling	84.00 to	85.00
No. 1 dealer bundles	85.00 to	86.00
No. 2 bundles	56.00 to	57.00
Machine shop turnings	17.00 to	18.00
Shoveling turnings	21.00 to	22.00
Cast iron borings	26.00 to	27.00
No. 1 RR hvy. melting	79.00 to	80.00
Rails, random length	76.00 to	77.00
Rails, 3 ft. and under	91.00 to	92.00
RR specialties	79.00 to	80.00
Cupola cast	66.00 to	67.00
Heavy breakable cast	40.00 to	41.00
Stove plate	85.00 to	86.00
Steel car wheels	85.00 to	86.00
Rerolling rails	99.00 to	100.00
Unstripped motor blocks	49.00 to	50.00

Birmingham

No. 1 hvy. melting	$ 73.00 to	$ 74.00
No. 2 hvy. melting	69.00 to	70.00
No. 1 dealer bundles	73.00 to	74.00
No. 2 bundles	49.00 to	50.00
No. 1 busheling	73.00 to	74.00
Shredder scrap	95.00 to	96.00
Machine shop turnings	28.00 to	29.00
Shoveling turnings	39.00 to	40.00
Cast iron borings	36.00 to	37.00
Electric furnace bundles	69.00 to	70.00
Elec. furnace, 3 ft. & under	75.00 to	76.00
Structural and plate, 2 ft.	94.00 to	95.00
Structural and plate, 4 ft.	86.00 to	87.00
No. 1 RR hvy. melting	86.00 to	87.00
Scrap rails, random lgth	80.00 to	81.00
Rails, 2 ft. and under	97.00 to	98.00
Angles and splice bars	86.00 to	87.00
No. 1 cupola cast	82.00 to	83.00
Unstripped motor blocks	74.00 to	75.00

Cincinnati

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 57.00 to	$ 58.00
No. 2 hvy. melting	51.00 to	52.00
No. 1 dealer bundles	79.00 to	80.00
No. 2 bundles	30.00 to	31.00
Machine shop turnings	11.00 to	12.00
Shoveling turnings	14.00 to	15.00
Cast iron borings	24.00 to	25.00
Low phos. 18 in. and under	82.00 to	83.00
Rails, random length	64.00 to	65.00
Rails, 2 ft. and under	84.00 to	85.00
No. 1 cupola cast	66.00 to	67.00
Heavy breakable cast	29.00 to	30.00
Drop broken cast	71.00 to	72.00

New York

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 38.00 to	$ 40.00
No. 2 hvy. melting	31.00 to	32.00
No. 2 dealer bundles	20.00 to	22.00
Mixed borings and turnings	10.00 to	11.00
Machine shop turnings	4.00 to	6.00
Shoveling turnings	10.00 to	12.00
Clean cast, chem. borings	35.00 to	36.00
No. 1 machinery cast	79.00 to	80.00
Mixed yard cast	50.00 to	51.00
Heavy breakable cast	10.00 to	12.00
Stainless		
18-8 prepared solids	370.00 to	390.00
18-8 turnings	270.00 to	310.00
430 prepared solids	90.00 to	100.00
430 solids	75.00 to	85.00

Boston

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 49.00 to	$ 51.00
No. 2 hvy. melting	39.00 to	41.00
No. 1 dealer bundles	53.00 to	55.00
No. 2 bundles	32.00 to	34.00
No. 1 busheling	56.00 to	58.00
Shredder scrap	59.00 to	61.00
Machine shop turnings	12.00 to	14.00
Shoveling turnings	18.00 to	20.00
No. 1 machinery cast	72.00 to	77.00
Mixed cupola cast	44.00 to	46.00
Heavy breakable cast	8.00 to	10.00

San Francisco

No. 1 hvy. melting	$ 40.00 to	$ 42.00
No. 2 hvy. melting	34.00 to	36.00
No. 1 dealer bundles	31.00 to	33.00
No. 2 dealer bundles	20.00 to	21.00
Machine shop turnings	8.00 to	9.00
Cast iron borings	8.00 to	9.00
No. 1 cupola cast	80.00 to	82.00

Los Angeles

No. 1 hvy. melting	$ 34.00 to	$ 36.00
No. 2 hvy. melting	28.00 to	30.00
No. 1 dealer bundles	26.00 to	28.00
No. 2 dealer bundles	16.00 to	18.00
Machine shop turnings	7.00 to	8.00
Shoveling turnings	8.00 to	9.00
Cast iron borings	8.00 to	9.00
Elec. furnace, 1 ft. and under (foundry)	67.00 to	69.00
No. 1 cupola cast	72.00 to	74.00

Seattle

No. 1 hvy. melting	$ 60.00 to	$ 62.00
No. 2 hvy. melting	51.00 to	53.00
No. 2 bundles	35.00 to	37.00
No. 1 cupola cast	89.00 to	90.00
Mixed yard cast	80.00 to	82.00

Hamilton, Ont.

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 76.00
No. 2 hvy. melting, cut 2 ft. and under	66.00
No. 1 dealer bundles	86.00
No. 2 bundles	58.00
Mixed steel scrap	51.00
Bush. new fact. prep'd	86.00
Bush. new fact. unprep'd	69.00
Machine shop turnings	30.00
Short steel turnings	30.00
Mixed borings and turnings	19.00
Cast scrap	97.00

Houston

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 64.00 to	$ 65.00
No. 2 hvy. melting	54.00 to	55.00
No. 2 bundles	33.00 to	34.00
Machine shop turnings	13.00 to	14.00
Crushed turnings	23.00 to	24.00
Shredder scrap	75.00 to	76.00
Cut structural plate, 2 ft. and under	87.00 to	88.00
Cut structural plate, 5 ft. and under	72.00 to	73.00
Unstripped motor blocks	52.00 to	53.00
Cupola cast	83.00 to	84.00